

TRANSLATION (RW-187PCT):

**Translated Text of WO 2005/068287 A1 (PCT/EP2004/000307)  
with Amended Pages Incorporated Therein**

DEVICE FOR CLEANING THE HULL OUTSIDE OF A BOAT

This invention relates to a device for cleaning the hull outside of a boat consisting of a longish float with a handle fixed at one end of the float, whereby at least one cleaning means provided with brushes is placed preferably replaceable on a flat side of the float.

A cleaning device for the hull outside of a boat is known for example from the WO 01/70567 A1. This device consists of a longish flat float, whereby a foamed synthetic material with enclosed air bubbles is provided as material for the float, the air bubbles causing that the float when immersed in water tries to rise to the surface because of the buoyancy. A stick is fixed on the flexible float for guiding the cleaning device. A cleaning means the shape of which substantially corresponds to the shape of the float is fixed on the one flat side of the float by means of Velco fasteners.

The hull outside of a boat which is under the water surface can be cleaned by means of such a cleaning device. For this purpose, a person plunges the cleaning device into water either from the boat or even from an adjacent gangboard and scrubs the hull outside with the cleaning means. Since the hull outside is inclined downwards and since the float tries to rise to the water surface, this float pushes the cleaning means to the hull outside of the boat so that thus the necessary application pressure for the cleaning process is

guaranteed. Furthermore since the float as well as the cleaning means are configured flexible, they can substantially adapt themselves to the contour of the hull outside of the boat so that the cleaning element bears on the hull outside over the whole length. The sediments adhering to the hull outside, such as for example algae or mussels, can thus be removed by a scrubbing movement.

Due to transversely running brushes which are integrated into the cleaning means, spaced from each other and projecting over the surface of the cleaning means, the device can also be used for cleaning boat hulls of motor boats in order to lap over and clean the lifting strakes in longitudinal direction of the hull as well as irregularities of the outside of the hull which exist in clinker planking.

In practice it has proved disadvantageous that for such a cleaning device because of the former configuration of the brushes the hull of a boat is cleaned only insufficiently in the area of the lifting strakes, in particular for lifting strakes running on the hull outside parallel to the water line. The cleaning is further impeded by the fact that the contour of the hull outside of a boat changes in longitudinal direction from bow to stern.

An insufficient cleaning is also effected by the cleaning device disclosed in publication FR 2 753 889. The cleaning device disclosed in this publication includes a brush whose bristles are arranged at an angle relative to the surface of a body. However, all bristles have the same length and extend in the same direction. Consequently, the cleaning device disclosed in publication FR 2 753 889 has the disadvantage

that it can only be used for the first cleaning step, because a high flexibility is not provided already from the outset. However, a high flexibility with respect to the adaptation to surfaces is not provided especially at the outer side of the hull which has grooves and corrugations.

Considering the prior art, the aim of the invention is to improve a cleaning device of the above mentioned type in such a manner that the most different hull contour with the most different configurations of lifting strakes or plankings can be cleaned with this device easily and accurately.

This aim is achieved by a device having the features recited in claim 1.

In an advantageous configuration of the invention, the inclined bristles extend under an angle ( $\beta$ ) between  $100^\circ$  and  $145^\circ$ , preferably between approximately  $110^\circ$  and approximately  $135^\circ$ , particularly preferably between approximately  $67,5^\circ$  and approximately  $112,5^\circ$  from the at least one surface of the body. Thus a further variability of the adjusting of the bristles is achieved for a constant exact fixing on the body of the brush so that in particular a more individual and more extensive adaptation to the most different hull contour with the most different configurations of lifting strakes is made possible.

For the further improvement of the adaptability, the bristles have in an advantageous configuration of the invention different angles and/or lengths. In a further configuration of the invention, the length of the bristles increases or is

reduced in the direction of extension of the front side of the surface of the body.

A further advantageous configuration of the invention provides that the bristles of the brushes of the at least one surface form in the cross section a generating curve which has at least three corners. In a preferred configuration of the invention, the generating curve forms in cross-section an irregular pentagon.

The bristles can have a diameter of approximately 0,2 mm to approximately 0,5 mm and/or a length of approximately 10 mm to approximately 70 mm.

Advantageously at least one brush has bristles with different diameters and/or lengths. A further embodiment of the invention provides that at least two brushes are configured differently. Due to these measures, a further improvement of the adaptability to the most different hull contour with the most different configurations of lifting strakes can be achieved.

The bristles can be wired with the body in order to achieve a safer fixing of the bristles on the body of the brush.

According to a particularly preferred configuration of the invention, the brushes are placed interchangeable in the device, preferably with a screwed connection. On the one hand used brushes can easily be replaced and on the other hand depending on the case of application harder or softer brushes can be used.

In a further embodiment of the invention, a base plate provided with a connecting element is placed on the flat side of the float opposite to the cleaning means and the float and the handle, for example a stick, are connected with each other swivellable against each other over the connecting element. Due to this swivellable connection of the stick to the float and thus to the cleaning means as well, it is possible that with the scrubbing movements carried out by the operating staff the float and the cleaning means come to bear exactly to the respective outer contour of the boat hull since the swivellable connection to the stick only serves as a guide of the cleaning means of the float but the position of the float and cleaning means to the outer contour of the hull can adjust itself freely due to the swivellable bearing.

According to a first preferred embodiment of the invention, the connecting element is configured as a connection substantially made of a rigid rubber material which is connected on the one hand with the base plate and on the other hand with the stick. This connection made of the rigid rubber material makes possible on the one hand a swivellable movement between the stick and the float but on the other hand is so stiff that the float and the cleaning means can be exactly controlled by the stick. The rubber connection allows preferably an excursion of the stick from the rest position of approximately  $\pm 10^\circ$ .

In order to bring the float directly into a position bearing on the hull, it is furthermore proposed that the stick is fixed opposite to the float by being U-bent on the base plate by the connection, whereby the U-bend between the stick and the base plate is of  $5^\circ$  to  $10^\circ$ , preferably  $7^\circ$ .

According to a second embodiment of the invention, the connecting element is configured as a hinge joint, in particular a ball-and-socket joint. Such a configuration of the hinge joint is particularly simple and cheap and can for example be made in that a joint ball which can be inserted into a bearing shell formed on the base plate is formed on the hinge-sided end of the stick.

According to a second embodiment of the invention, the hinge joint has two articulated axles placed at a right angle to each other. Such a hinge joint can for example be configured as an universal joint or a cardan joint. It is also possible with this double articulated connection of stick and float or cleaning means that the cleaning means adapts itself exactly to any contour change of the boat contour. Compared with the ball-and socket joint the double articulate configuration of the hinge joint has the advantage that the float and the cleaning means can always be guided in the long stretched-out orientation, whereas when using the ball-and-socket joint a torsion of the flat end of the cleaning means around the longitudinal axis of the stick is also possible.

Furthermore it is proposed with the invention that a peripheral bead made of the material of the float is configured on the flat side of the float provided with the base plate. This peripheral bead increases on the one hand the application pressure of the cleaning device to the outer contour of the hull because of the increased buoyancy of the float. But it is moreover also avoided that the base plate during the scrubbing movement of the cleaning device comes

into contact with the hull outside of the boat since the peripheral bead forms the lateral border of the float.

The buoyancy of the float and thus the application pressure on the hull can furthermore still be reinforced in that at least one body fillable with a gas, in particular with air, is embedded into the material of the float. Particularly preferably this body fillable with gas is configured as an inflatable hose.

For the use of a float configured with a peripheral bead, the body fillable with gas is advantageously placed in the area of this peripheral bead. The filling of this body with the gas preferably takes place over an admission and discharge valve placed on the stick and in particular on the handle part of the stick. According to a practical embodiment of the invention, the body fillable with gas can be manually inflated by the admission and discharge valve.

According to a preferred embodiment of the invention, it is proposed in order to increase the application pressure generated by the float onto the hull outside of the boat that the stick has at least one lockable hinge. Due to this configuration of the hinge in the stick, it is possible to orientate the float and the cleaning means already from the beginning approximately parallel to the outer contour of the hull. Thus, a certain application pressure can be applied against the hull outside of the boat by the stick which is guided by the operating staff.

Furthermore the invention proposes that the stick is slidable and extendable in the manner of a telescope. Because of this

configuration, the device according to the invention can be very easily transported and can easily be stored even when the space is limited on board a boat.

Advantageously the stick is manufactured of metal, in particular of aluminium. The embodiment of the stick in metal has, besides the weight advantage of this light metal, the supplementary advantage that aluminium is substantially resistant to sea water.

The flexibility of the float and thus the adaptation of the cleaning device to the contour of the hull outside during the cleaning process can further be improved according to the invention in that at least one tongues forming slit is formed in the float parallel to the flat sides from the front free end. When there is a change in the bending of the float, the tongues of the float are displaced relatively to each other, whereby the adjacent flat sides of the tongues glide against each other. Thus the flexibility of the float substantially depends only on the thickness of the single tongues. Due to the slit configuration in the float, the cleaning behaviour is on the whole improved by the better contour adaptation.

In order to avoid that the tongues configured in the float are displaced against each other in such a manner that the tongue provided with the base plate cannot exert any pressure any longer onto the tongue provided with the cleaning means, it is further proposed by the invention that guiding elements are placed on the surfaces of the tongues turned to each other.

According to a practical embodiment of the invention, at least one groove is configured in a tongue and at least one vault



engaging into the groove is configured for forming the guiding elements.

This being, the vault can be made of the material of the respective tongue or be made of a material placed in the respective tongue, in particular of rubber.

The immersion of the cleaning device into the water as well as the movement of the cleaning device under water can be improved in that the front end of the float and of the cleaning device are rounded.

Finally it is proposed by the invention that a sliding part can be put onto the front end of the float in cleaning direction in order to be able to follow sharp contour transitions such as, for example, at the transition hull/leeboard. This being, this sliding part has advantageously the shape of an asymmetrical triangle, whereby the angular position of the triangle with respect to the float is adjustable.

Preferably the base has a shape with a cuneiform cross section, whereby the surface out of which the bristles come is placed inclined with an angle between approximately  $2,5^{\circ}$  and approximately  $30^{\circ}$ , preferably  $5^{\circ}$  and  $15^{\circ}$ , whereby the base can have a triangular or trapezoid cross section.

The invention is based on the knowledge that due to the adjusting of the surface from which bristles fixed on the body of a brush are extending an adjusting of the bristles can be achieved with the simultaneously exact fixing of the single bristles sometimes advantageously assembled as segments on the

body of a brush. Due to the adjusting of the bristles of a brush which can thus be obtained, a simple and accurate cleaning of the most different hull contours with the most different configurations of lifting strakes is advantageously made possible.

Further details, characteristics and advantages of the invention result from the following description of the attached drawings in which preferred embodiments of a cleaning device according to the invention are schematically represented.

Fig. 1 shows a schematic view of the hull of a boat with a cleaning device according to the invention for cleaning the hull outside.

Fig. 2 shows a schematic view of the hull of a boat with a retractable leeboard.

Fig. 3 shows a perspective view of a first embodiment of the cleaning device according to the invention.

Fig. 4 shows a perspective view of a second embodiment of the cleaning device according to the invention.

Fig. 5 shows a top view of a first embodiment of a body of a brush of a cleaning device according to the invention.

Fig. 6 shows a side view of the body according to fig. 5.

Fig. 7 shows a schematic side view of a first embodiment of a brush with a body according to fig. 5 and fig. 6.

Fig. 8 shows a schematic side view of a second embodiment of a brush with a body according to fig. 5 and fig. 6.

Fig. 9 shows a schematic side view of a third embodiment of a brush with a body according to fig. 5 and fig. 6.

Fig. 10 shows a top view of a second embodiment of a body of a brush of a cleaning device according to the invention.

Fig. 11 shows a side view of the body according to fig. 10.

Fig. 12 shows a schematic side view of a first embodiment of a brush with a body according to fig. 10 and fig. 11.

Fig. 13 shows a schematic side view of a second embodiment of a brush with a body according to fig. 10 and fig. 11.

Fig. 14 shows a schematic side view of a third embodiment of a brush with a body according to fig. 10 and fig. 11.

Fig. 15 shows a schematic view in detail of a boat with a cleaning device according to the invention for cleaning the hull outside.

Fig. 16 shows a further schematic view in detail of the hull of a boat with a cleaning device according to the invention for cleaning the hull outside.

Fig. 17 shows schematically the hull of a traditional motor boat with lifting strakes and an embodiment of the cleaning device according to the invention.

In fig. 1 a hull 1 of a boat 2 is represented, whereby it can be recognized that the hull outside 3 is arcuated approximately S-shaped.

Furthermore, a cleaning device 4 by means of which the hull outside 3 of the boat can be cleaned can be seen in the representation according to fig. 1. This cleaning device 4 represented enlarged in fig. 3 and 4 substantially consists of a float 5 and of a cleaning means 7 fixed interchangeable on this float 5 by means of Velcro fasteners 6.

This being, the float 5 is configured substantially as a longish flat body and is made of foamed synthetic material with enclosed air voids so that the float 5 has a low specific weight and thus a high buoyancy in water. Parallel to both flat sides 8 of the float 5, a slit 9 is formed in the middle from the front free end, slit through which the front part of the float 5 is divided into two tongues 5' and 5". The length of the slit 9 is for the represented embodiment approximately  $\frac{3}{4}$  of the length of the float 5.

The cleaning means 7 which is also longish and corresponds to the shape of the float 5 is fixed on the lower flat side 8 of the float 5 by means of the Velcro fasteners 6. The cleaning means 7 can be formed by synthetic fibres connected with each other which define a rough surface for the cleaning process.

A base plate 10 for fixing a stick 11 is placed on the upper flat side 8 of the float 5. The connection of the stick 11 with the base plate 10 takes place over a connecting element 12 which makes possible a fixed or swivellable positioning of

the stick 11 on the base plate 10 so that the float 5 and the cleaning means 7 are connected eventually tiltable and rotatable with the stick 11 in order to be able to adapt themselves accurately to the contour of the hull outside 3 of the boat during the cleaning procedure. A locking possibility can also be provided.

Fig. 2 shows the hull 1 of a boat with a retractable leeboard 26. As can be seen in the representation, the transition of the hull 1 with the leeboard 26 constitutes a sharp contour transition which the cleaning device 4 can follow only very difficult and without a continuous cleaning contact. In order to eliminate this disadvantage, a sliding part 27 can be put onto the front end of the float 5 in cleaning direction. In the represented embodiment, the sliding part 27 has the shape of an asymmetrical triangle. For the adaptation to different transition angles, the sliding part 27 can be locked adjustable at the front end of the float 5 in such a manner that another angle of the asymmetrical triangle is always available.

Fig. 17 shows the hull 1 of a motor boat with lifting strakes and with an embodiment of a cleaning device according to the invention.

For the embodiment represented in fig. 4, the connecting element 12 is configured as a connection 13 made of a substantially rigid rubber material which is connected on the one hand with the base plate 10 and on the other hand with the stick 11. This connection 13 preferably manufactured of hard rubber makes possible a swivelling of the stick 11 and the base plate 10 against each other of approximately  $\pm 10^\circ$ .

For the embodiment represented in fig. 3, the connecting element 12 is configured as a hinge joint 14 with two articulated axles 15 placed at a right angle the one to the other around which the float 5 and the cleaning means 7 are swivellable with respect to the stick 11.

As can be seen in fig. 1, the stick 11 has a lockable hinge joint 16 over which a rough orientation of the cleaning device 4 with respect to the hull outside 3 of the boat 2 with respect to the stick 11 can be adjusted. In order to be able to transport easily the cleaning device 4, the stick 11 is configured telescoping sliding in each other and retractable. For this purpose, the stick 11 has screwed connections 17 with which the single parts of the stick 11 can be locked to each other. Besides the easy transport of the cleaning device 4, the telescoping configuration of the stick 11 has the advantage that the length of the stick 11 can be adjusted according to the needs.

The embodiment in fig. 4 shows a particularly advantageous configuration of the stick 11. In order to avoid a swinging and a deflection of the upper stick part, i.e. above the hinge joint 16, this part is not configured as a rigid one-piece part. The multipart configuration with the stick parts telescoping sliding into each other over the screwed connection 17 as well as with the handle part 11a which approximately constitutes a third of the length of the upper stick part, makes possible a balanced power relation and a good power transmission over the stick 11 to the rubber connection 13 and thus to the float 5. The float 5 can thus be

moved stable and with an accurate straight course along the contour of the boat hull.

The configuration of the lower stick part between the connection 13 and the hinge joint 16 is advantageously configured telescoping so that the boat hull can be cleaned without bending down or inclined immersion of the cleaning device 4 due to the appropriate length adjustment possibility of the stick 11 even to the lower end of the leeboard. This supplementary adjustability of the lower stick part makes also possible the accurate cleaning even of very wide boats.

The front end of the float 5 represented in fig. 3 and of the cleaning means 7 are rounded in order to make possible an easier immersion of the cleaning device 4 into the water and an easier guiding of the cleaning device in the water. The front end of the embodiment according to fig. 2 can of course also be rounded.

As it can further be seen in fig. 3, a peripheral bead 18 of the material of the float 5 is configured on the upper flat side 8 of the float 5. The mass of the material of the float 5 and thus the application pressure of the cleaning device 4 onto the hull outside 3 is increased by this bead 18. Moreover the bead 18 surrounds the base plate 10 for fixing the stick 11 on three sides so that a contact between the base plate 10 and the hull outside 3 can be excluded.

The buoyancy of the float 5 and thus the application pressure to the hull of the boat can further be increased in that a body 19 fillable with a gas is embedded into the material of the float 5. As can be seen in fig. 3, this body 19 fillable

with gas can be placed in the area of the bead 18. In the represented embodiments, the filling of the body 19 takes place over a line 20 which ends with an admission and discharge valve 21 on the handle part 1a of the stick 11. The body 19 can be filled for example by manual inflation with gas, in particular with air over this admission and discharge valve 21 if need be, for example for very sticking deposits, even during the work under water. The gas can also be discharged again if such a high application pressure is no longer necessary.

For cleaning the hull outside 3 of the boat 2 below the water surface, the operating person carries out a scrubbing movement in order to remove algae, mussels or the like from the hull outside 3. Because of the buoyancy of the float 5 the cleaning means 7 is pressed against the hull outside 3. Because of the flexibility of the float 5 as well of the cleaning means 7 and of the connection of the stick 11 and the float 5 over the hinge joint 12, the cleaning means 7 adapts itself exactly to the contour of the hull outside 3. According to the bending radius of the hull outside 3, both tongues 5' and 5" of the float are additionally offset to each other so that a further flexible adaptation to any hull shape is possible. With such a cleaning device 4, it is thus possible to clean the hull outsides 3 of boats 2 with any hull shape.

In order to avoid that both tongues 5', 5" are displaced to each other, that the tongue 5' provided with the base plate 10 cannot apply any pressure any longer to the other tongue 5", for the embodiment according to fig. 4 guiding elements 22 are placed on the surfaces of the tongues 5', 5" turned to each other, guiding elements which are formed in the represented



embodiment by two grooves 23 in the tongue 5' and two corresponding vaults 24 in the tongue 5". Due to these guiding elements 22, the tongues 5' and 5" are fixed limited to each other without abolishing the flexibility caused by the slit 9.

By means of fig. 3 and fig. 4 it can be recognized that brushes 25 which are spaced from each other, transversely running and which are not represented in fig. 1 and fig 2 for reasons of clarity are embedded into the cleaning means 7, the bristles 31 of which project over the surface of the cleaning means 7. Such cleaning means 7 serve in particular for cleaning boat hulls of motor boats, whereby the brushes 25 serve for lapping over and cleaning the lifting strakes configured in longitudinal direction in motor boat hulls. The brushes 25 can also be directly embedded into the float 5 according to the embodiment represented in fig. 16 and fixed to the base plate 10 and thus constitute the sole cleaning means.

As can be recognized in particular with the bore holes 33 in the body 29 of the brushes 25 in fig. 5 and 6 or 10 and 11, the brushes 25 can be placed interchangeable by screwing the body 29 with the base plate 10 into the cleaning means 7 or into the float 5 in order to replace the brushes 25 for example if they are worn out.

The body 29 of a brush 25 which is represented in fig. 5 and 6 is configured here rectangular - as can be recognized by means of the top view in fig. 5 - and has the dimensions 190 mm by 50 mm. By means of the side view according to fig. 6, it can be recognized that the body 29 has a substantially trapezoid cross section. The parallel running sides 34 and 35 of the

trapezoid have here the dimensions 20 mm and 12 mm so that the surface 30 of the body 29 has an angle  $\alpha$  of approximately  $9^\circ$  to the surface 28 of the cleaning means or of the float 5.

The figures 7 to 9 show bristles 31 fixed respectively on the body 29 according to fig. 5 and 6 by wiring which extend from the body in order to form a brush 25. The bristles 31 of the brushes 25 represented in fig. 7 to fig. 9 have here a diameter of approximately 0,5 mm. For reasons of clarity, the bristles 31 of the brushes are represented as an example by bristles 31 fixed in fig. 7 to 9 respectively on the left and on the right on the body 29 and the dot-dash generating curve 32 is represented which indicates the bristles of the brushes 25 placed between both bristles 31 on the body 29. For the embodiments according to fig. 7 to 9, the dot-dash generating curve 32 forms respectively a pentagone with the sides 36 to 40. This being, the sides 36 and 39 are formed by the bristles 31 which are indicated in fig. 7 to 9 on the left and on the right of the brushes 25 and the side 40 is formed by the surface 30. The projection 38' on the vertical line of the sides 37 and 38 of the brushes 25 according to fig. 7 to fig. 9 has here a length of 70 mm. The projection 36' on the vertical line of the side 36 of the brushes 25 according to fig. 7 to fig. 9 has here a length of 25 mm. The projection 38' on the vertical line of the side 39 of the brushes 25 according to fig. 7 to fig. 9 has here a length of 40 mm, 50 mm or 60 mm. The bristles 31 have, as can be recognized with the bristles 31 represented in fig. 7 to 9, different angles  $\beta$  to the surface 30 of the body 29. The length of the bristles 31 increases in extension direction E of the front side of the surface 30 of the body 29.

The body 29 of a brush 25 which is represented in fig. 10 and fig. 11 is - as can be recognized on the top view of fig. 10 - here rectangular and has the dimensions 190 mm by 50 mm. On the side view according to fig. 11, it can be recognized that the body 29 has a cross section substantially made of two trapezoid elements. The parallel running sides 34 and 35 of the respective trapezoid have here the dimensions 20 mm and 12 mm so that the surfaces 30 of the body 29 to the surface 28 of the cleaning means have here an angle  $\alpha$  of approximately  $18^\circ$ .

The fig. 12 to 14 show bristles 31 respectively fixed by wiring to the body 29 according to fig. 10 and fig. 11 which extend from the body to form a brush 25. The bristles 31 of the brushes 25 represented in the fig. 10 to 11 have here mixed a diameter of approximately 0,2 mm and approximately 0,5 mm. The bristles 31 of the brushes are represented for more clarity as an example by the bristles 31 fixed in fig. 12 to 14 respectively on the left and on the right on the body 29 and the dash-dot generating curve 32 indicates the bristles of the brushes 25 which are placed between these two bristles on the body 29. For the embodiments according to fig. 12 to fig. 14, the dash-dot generating curve 32 constitutes respectively a pentagone with the sides 36 to 40. This being, the sides 36 and 39 are formed by the bristles 31 of the brushes 25 indicated on the left or on the right in fig. 12 to fig. 14 and the side 40 is formed by the surface 30. The projection 36' on the vertical line of the side 36 of the bristles 25 according to fig. 12 to fig. 14 has here a length of 25 mm. The side 39 of the bristles 25 according to fig. 12 to fig. 14 have here a length of 40 mm, 50 mm or 60 mm. The bristles 31 have, as can be recognized by means of the represented bristles 31 in fig. 12 to 14, different angles  $\beta$  to the

respective surface 30 of the body 29. The length of the bristles 31 increases in extension direction E of the front side of the surface 30 of the body 29.

Fig. 15 and 16 show the cleaning device 4 with bristles 25 according to fig. 5 to fig. 9. The bristles 31 take without any problem and accurately all the positions in the area of the acute lifting strakes 41 or of the vertical lifting strakes 42 in all the angles and straight lines which is not the case of the brushes known until now by the prior art according to fig. 17 because of the configuration of the brushes or of the shape of the brush body.

The embodiments of the invention represented in the figures serve only to explain the invention and are not restrictive for the invention, in particular separately manufactured brushes according to the invention for cleaning devices can also be separately a subject of the invention.

List of reference numerals

1	Hull
2	Boat
3	Hull outside
4	Cleaning device
5	Float
5'	Tongue
5"	Tongue
6	Velcro fastener
7	Cleaning means
8	Flat side
9	Slit
10	Base plate
11	Stick
11a	Handle part
12	Connecting element
13	Connection
14	Hinge joint
15	Articulated axle
16	Hinge
17	Screw connection
18	Bead
19	Body
20	Line
21	Admission and discharge valve
22	Guiding element
23	Groove
24	Vault
25	Brush
26	Leeboard
27	Sliding part

28 Surface (cleaning means (7))  
 29 Body (brush (25))  
 30 Surface (body (29))  
 31 Bristle (brush 25))  
 32 Generating curve (bristles)  
 33 Bore hole  
 34 Side (trapezoid)  
 35 Side (trapezoid)  
 36 Side (generating curve (32))  
 36' vertical projection (side (36))  
 37 Side (generating curve (32))  
 37' Vertical projection (side (37))  
 38 Side (generating curve (32))  
 39 Side (generating curve (32))  
 39' Vertical projection (side (39))  
 40 Side (generating curve (32))  
 41 Lifting strakes  
 42 Lifting strakes  
 43 Corners  
 E Extension direction  
 $\alpha$  Angle  
 $\beta$  Angle